Day 145 **B Tier 10-a-day: Model Solutions**

1 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.
Work out the mean.

Multiply each value by its frequency and add: 1 × 5 + 2 × 5 + 3 × 2 + 4 × 6 = 45
Total frequency = 5 + 5 + 2 + 6 = 18
Mean = 45 ÷ 18 = 2.5
Answer: 2.5

2 Angles in triangles

Triangle XYZ is isosceles with XY = XZ.
Angle YXZ = 56°.
Work out the size of angle XYZ.

The base angles of an isosceles triangle are equal
Angles in a triangle add up to 180°
180 − 56 = 124
124 ÷ 2 = 62
Answer: 62°

3 Decimal calculations

Work out
(a) 5.8 × 0.6
(b) 0.31 × 9

(a) 58 × 6 = 348
There are 2 decimal places in total, so the answer is 3.48
(b) 31 × 9 = 279, then divide by 100: 2.79
Answer: (a) 3.48 (b) 2.79

4 Equations with brackets

Solve 2(2x + 7) = 6

Divide both sides by 2: 2x + 7 = 3
Subtract 7 from both sides: 2x = −4
Divide both sides by 2
Answer: x = −2

5 Factors and multiples

Write down all the common factors of 25 and 40.

Factors of 25: 1, 5, 25
Factors of 40: 1, 2, 4, 5, 8, 10, 20, 40
The common factors are the numbers in both lists
Answer: 1, 5

6 Independent events

Two fair 4-sided dice are each rolled once.
Each dice is numbered from 1.
Work out the probability that both dice show a number greater than 2.

P(first greater than 2) = $\frac{1}{2}$

P(second greater than 2) = $\frac{1}{2}$

Multiply: $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Answer: $\frac{1}{4}$

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7 Sequences from patterns

Matchsticks are used to make a row of hexagons.
1 hexagon needs 6 matchsticks, 2 hexagons need 11 and 3 hexagons need 16.
(a) Find an expression, in terms of n, for the number of matchsticks needed for n hexagons.
(b) Dan uses 146 matchsticks to make a row. How many hexagons are in his row?

(a) The number of matchsticks goes up by 5 each time, so the rule starts with 5n
When n = 1 we need 6, and 5 × 1 = 5, so add 1: 5n + 1
(b) 5n + 1 = 146
5n = 145
n = 145 ÷ 5 = 29
Answer: (a) 5n + 1 (b) 29

8 Mixed numbers

Work out $2\frac{3}{5} - 1\frac{5}{6}$
Give your answer as a fraction in its simplest form.

Write as improper fractions: $\frac{13}{5} - \frac{11}{6}$
Common denominator 30: $\frac{78}{30} - \frac{55}{30} = \frac{23}{30}$
As a mixed number: $\frac{23}{30}$
Answer: $\mathbf{\frac{23}{30}}$

9 Radius from area or circumference

The area of a circle is 67 m^2. (Calculator)
Work out the radius of the circle.
Give your answer correct to 1 decimal place.

Area = πr^2, so $r^2 = 67 \div \pi = 21.327...$
$r = \sqrt{21.327} = 4.618...$
r = 4.6 m (1 d.p.)
Answer: 4.6 m

10 Iteration

Here is an iteration formula.
$x_{n+1} = \sqrt{4x_n + 12}$
$x_0 = 1$
(a) Work out x_1
(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = \sqrt{4 \times 1 + 12} = \sqrt{16} = 4$
(b) $x_2 = \sqrt{4 \times 4 + 12} = \sqrt{28} = 5.2915...$
= 5.292
Answer: (a) 4 (b) 5.292